



CENTRAL ASIAN JOURNAL OF LITERATURE, PHILOSOPHY AND CULTURE

Volume: 03 Issue: 05 May 2022

The Opposition between Realism and Non-Justificationism in Karl Popper's Rationality of Science: In Search of the Conditions for the Growth of Knowledge

Dzelajei S. Basilis

PhD Candidate, Department of Philosophy, The University of Yaounde I, Cameroon
bazo29@yahoo.com

Nelson Shang

*PhD, Department of Philosophy, Higher Teacher Training College,
The University of Bamenda, Cameroon, nelsonshang2017@yahoo.com*

Received 28th Mar 2022, Accepted 16th Apr 2022, Online 20th May 2022

Abstract:

This paper situates us within the context of an internal conflict in the Philosophy of Karl Popper. On the one hand, Popper is an ardent proponent of scientific realism – the view that science seeks to formulate true theories that depict the structure of the universe; and on the other hand, the very Karl Popper propounds Non-Justificationism in science – a negativist methodology which asserts that the logic of science seeks not the justification but the refutation of theories. This non-justificationism seems asymmetric to the realist optimistic ambition of justifying the reliability of scientific knowledge. To resolve this tension between realism and non-justificationism in Popper's epistemology some philosophers have proceeded by revising his method of falsification (Imre Lakatos), others have opted for a reinterpretation of his realism (Evandro Agazzi, Mario Alai,) while some have given an instrumentalist status to popper's rationality of science (Peter Godfrey-Smith, Anthony O'Hear). Our argument in this Paper is that to resolve the contradiction within Popper's rationality of science we have to situate the two conflicting theses (Realism and non-justificationism) within the general problem of Popper's epistemology. That is, the problem of the conditions necessary for the growth of scientific knowledge. Thus, after examining the basic tenets of Popper's realism and illustrating the levels of the opposition between realism and non-justificationism, we have gone beyond other solutions to defend the conflation of realism and non-justificationism as the condition for the growth of knowledge. Popper thus emerges out of our analysis as a 'critical realist' who rejects 'dogmatic optimism' and creates 'critical optimism' in his evolutionary epistemology.

Keywords: Karl Popper, Non-justificationism, Realism, instrumentalism (anti-realism), critical rationalism, optimism, objectivity and Truth.

Introduction

Consistency of thought is what Philosophers seek in the development of their philosophical ideas. In some cases, philosophers have overtly declared their rupture from their early views.¹ However, when such internal contradictions are not addressed by the author, they become a challenge to those who have an interest in understanding the author's philosophical edifice. The philosophical interest behind this paper is to resolve the crisis of consistency within Karl Popper's rationality of science. Karl Popper defends a Non-justificationist methodology of science which is negative and at the same time he is an ardent defender of scientific realism which is optimistic on the ability of science to establish certain and reliable knowledge of the mind-independent world. Knowledge, to Popper, proceeds from conjectures which are tentative solutions to problems. We cannot establish positive knowledge whether at the subjective level or in the domain of scientific theories. Karl Popper argues that we cannot justify the certainty or the probability of knowledge. The epistemological thesis of scientific realism holds that "scientists ought to seek to formulate true theories that depict the structure of the universe"² Popper defends several theses of scientific realism in his rationality of science. He subscribes to the metaphysical thesis of realism, which defends the mind-independent world. Popper thus affirms that "there is a real world, and that the problem of knowledge is the problem of how to discover this world"³ The discovery of this world is through the descriptive and explanatory role of scientific theories. As a realist then, he remarks that the "aim of science is to find satisfactory explanations of whatever strikes us as being in need of explanation"⁴ It is effectively on the 'satisfactory explanations' of scientific statements that realists erect their epistemological optimism. With this epistemological thesis, the realists go beyond the instrumentalist restriction of science to the predictive role to assert that such predictions work because they are about a real and mind-independent world and as such, the reliability and credibility of science reside in the ability of theories to make true or approximately true descriptions of the world.

Even though Popper defends realism, his negative methodology instead ushers in pessimism to his rationality of science. Rejecting inductive psychology of learning because of the problems of induction and the limitations of psychologism, Popper develops a deductive psychology in which knowledge is essentially conjectural. In his evolutionary argument, man like other animals have inner mechanisms of expectations and anticipations. Knowledge begins when these anticipations clash with experience. This leads to a problem and necessitates the search for solutions through conjectures or trial and error. Thus, the growth of knowledge, to Popper, "proceeds from old problems to new problems, by means of conjectures and refutations."⁵ Given human fallibilism and the conjectural character of knowledge, Popper defends falsification as a criterion of scientificity. That is, a theory is scientific only if it is falsifiable. Falsification thus is used in testing scientific theories and in demarcating between science and non-science. This amounts to saying that any attitude which consists in immunizing a theory against falsification is irrational and unscientific. If scientific theories are developed to be falsified and not justified, then there is the valorization of error and the crisis of the reliability of scientific knowledge. While the objective truth plays just a regulatory function, in the correspondence theory of truth, which he defends, prefers verisimilitude to truth. Since we cannot establish absolute correspondence between our theories and the world, it is preferable to talk of the approximation to truth and not absolute correspondence.

¹ For instance, the early Wittgenstein of the *Tractatus* and late Wittgenstein of *Philosophical Investigation* are two contradictory episodes in the philosophical career of the same author.

² John Losee, *A Historical Introduction To Philosophy of Science*, 4th ed., New York, Oxford University Press, 2001, P. 154.

³ Karl Popper, *Unended Quest, An Intellectual Autobiography*, London-New York, Routledge, 1974, p. 84

⁴ Karl Popper, *Realism and the aim of science*, From Postscript to the Logic of Scientific Discovery, London-New York, Routledge, 1983, p. 132.

⁵ Karl Popper, *Objective Knowledge; An evolutionary approach*, revised edition, Oxford, Clarendon Press, 1974, p.258.

With the above tension between realism and non-justificationism, some philosophers argue that Popper's aversion for the truth and certainty render his position more of an instrumentalist and a skeptic. To Peter Godfrey-Smith, Popper is more of a skeptic than a realist. He remarks that, "Despite insisting that we can never support or confirm scientific theories, Popper believed that science is a search for true descriptions of the world. How can one search for truth if confirmation is impossible?"⁶ To Antony O'Hear, Popper's conjunction of falsification and the view that predictions can be falsified, "brings his philosophy close to instrumentalism, despite the explicit commitment to realism"⁷ Stathis Psillos, holds that Popper's argument of truthlikeness betrays his realist claims. That is "Scientific realists do not need a theory of truth-likeness which tells whether science moves closer to a truth that may lie millennia ahead; instead, realists seek a theory which can ground the judgment that current theories are close to the truth. Popper's theory remains silent on this"⁸ Besides these philosophers that reject Popper's realist status, others have instead reinterpreted his falsification criterion (Imre Lakatos⁹), others have opted for a reinterpretation of his realism (Evandro Agazzi¹⁰, Mario Alai) to render Popper's system to be consistent.

Our objective in this paper primarily is to illustrate the tension between realism and non-justificationism in Popper's philosophy. This, necessitates the examination of popper's basic tenets of realism so as to show how they contradict his negative methodology of science. The originality of our approach resides in going beyond existing attempts to resolve this tension and to propose a new method, which consists in situating the conflation of realism and non-justificationism within the general problem of popper's epistemology; the problem of the growth of knowledge. Such interpretation renders popper a critical realist, who prefers the promotion of 'critical optimism' to 'dogmatic optimism' as the objective of scientific realism.

THE BASIC TENETS OF SCIENTIFIC REALISM

The Problem of the aim of scientific theories is the nerve-center of the debate between scientific realism and the anti-realism of instrumentalism. Scientific realism is the theoretical frame work in epistemology which holds that the aim of science is to produce theories that are true or approximately true descriptions and explanation of a mind-independent world. Anti-realism or instrumentalism does not only reject the reality of a mind-independent world, but it also criticises the accordance of the descriptive role to scientific theories. That is, to attribute the descriptive role to scientific theories is to orientate science into metaphysical realm. Thus, P. Rowbottom defines instrumentalism as a philosophical theory which conceives science as, "an instrument for making predictions about observables and scientific discourse about the unobservable is merely an instrument for making predictions concerning the observable."¹¹ This follows that scientific theories are simply practical instruments whose function is to be enhance the prediction of the behavior of future phenomena. The question of the reality of the mind-independent world and concerns on epistemological values like truth, falsity and objectivity are not of importance in the anti-realist view of science.

⁶ Peter Godfrey-Smith, *An introduction to the Philosophy of science, Theory and Reality*, Chicago-London, University of Chicago Press, 2003, p.60.

⁷ Anthony O'Hear, *Karl Popper: The Arguments of the Philosophers*, London, Routledge, 1982, p.90.

⁸ Stathis Psillos, *Scientific realism, How Science Tracks the truth*, London-New York, Routledge, 1999, pp.244-245.

⁹ Imre Lakatos, *Methodology of Scientific Research Programmes*, Ed. John Worrall and Gregory Currie, Cambridge, Cambridge University Press, 1975.

¹⁰ Agazzi, Evandro *Varities of Scientific Realism, Objectivity and Truth in Science*, Cham, Springer, 2017.

¹¹ Darrell P. Rowbottom in, Juha Saatsi edition of, *Routledge Handbook of Scientific Realism*, London-New York, Routledge, 2018, p. 84.

The popular appeal of scientific realism resides in its quest to defend the reliability of scientific discourse. How can we justify the confidence we have in accepting what science tells us about the world? This is the practical question that different versions of scientific realism answer. Despite the variations in the different versions of realism, there are some traits that are transversal and thus permit the identification of a theory as being a form of realism. Stathis Psillos, identifies three basic tenets of scientific realism. Firstly, the metaphysical thesis to him holds that there is a mind independent structure of the world.¹² The world is not then structured by our cognitive categories as classical idealism of Immanuel Kant asserted. At the microphysical level, the world of science is that of concrete objects that we can apprehend using our senses and at the microphysical level, the world of science is that of unobservable but concrete realities like electrons, neutrons, etc., that we can apprehend using instruments. The second thesis of realism, to Stathis Psillos, is semantic stance. This thesis presents scientific theories as essentially, “truth-conditioned descriptions, of their intended domains, both observable and unobservable.”¹³ Thus, not only are scientific theories true but also the theoretical terms. In the third thesis, Psillos states the epistemic stance. This thesis describes, “mature and predictively successful theories as well-confirmed and approximately true of the world.”¹⁴ This implies that scientific realism is not against prediction as one of the aims of scientific theories. It instead goes beyond instrumentalism to hold that if we can make successful predictions using theories, then these theories and the predicted phenomena or world are all true.

Besides the triadic characterization of realism by Psillos, Howard Sankey and Dimitri Geriev (2011), outline over six basic tenets of scientific realism. In the first place, there is a symmetry between progress in science and the search for the truth. To them, “the aim of science is to obtain the truth, progress in science must consist in advance on that aim.”¹⁵ Even if science cannot attain an absolute truth, Sankey and Ginev argue that some aspects of science such as statements have been proven to be true. The truth that science searches is not then an absolute truth but truths that are explanatory in nature. This truth is not invented but it is discovered in the descriptions that science makes of the mind-independent world. The second feature is the epistemic thesis for it focuses on the nature of knowledge that science provides us from world. This thesis insists that science is capable of providing reliable knowledge of the observable and the unobservable objects. In the interpretative thesis, Sankey and Ginev assert that the only science-friendly interpretations of quantum physics, accept existence of the unobservables as real entities. The forth feature of scientific realism is the metaphysical thesis which has the same formulation like the one formulated above by Psillos. In the fifth thesis, Sankey and Ginev defend the correspondence theory of truth according to which, “for a statement to be true, the world must be the way that the statement says it is. The statement must correspond to the facts.”¹⁶ The seventh thesis of Sankey and Ginev that qualifies any theory as a form of scientific realism is the defence of reality of the objective world. It is this objective world that help scientists to ascertain of their theories are true or false. After outlining the different tenets of scientific realism in contemporary philosophy of science, it will be a question of examining how Karl Popper develops these tenets in his defence of scientific realism.

Karl Popper’s Defence of Scientific Realism: Critique of Anti-Realism

¹² Stathis Psillos, *Scientific Realism, How science tracks the truth*, p. xviii.

¹³ *Idem*.

¹⁴ *Idem*.

¹⁵ Howard Sankey Dimitri Ginev, “The Scope and Multidimensionality of the scientific Realism”, in *Gen Philo Sci*, N°42, 2011, pp. 263-283, Springer, p. 267.

¹⁶ *Idem*.

In the first place, Popper defines instrumentalism or anti-realism as the view that, “scientific theories of the so-called ‘pure’ sciences are nothing but computation rules”¹⁷ for predictions. From this definition, Popper deduces an inherent contradiction in instrumentalism. This contradiction consists in the treatment of pure science as applied science. The way in which rules are generated and applied in pure science is not the same as it is done in technological applications. To conceive scientific theories then as tools of prediction is to reduce pure science to applied science. While scientific theories are developed to be falsified or corroborated, instruments on the other hand are developed to be applied and the latter can only be rejected if they are broken. Popper thus affirms that, though instruments may weigh out, “it hardly makes sense to say that we submit instruments to severest tests.”¹⁸ Hence, instrumentalism avoids falsification which constitutes the basis of scientific rationalism. It is because of this aversion for falsification exercised by instrumentalism that Popper qualifies the latter as “an obscurantist philosophy.”¹⁹ By avoiding falsification, instrumentalism cannot account for progress in science. To Popper, progress in science, whether cognitive or practical, depends on severe testing of theories through falsification. Through falsification, we cognitively progress by learning from our errors and practically advance when old theories are replaced by new ones on the basis of their degrees of corroboration.

In the same way, Popper criticizes instrumentalism for its inability to guarantee scientific discoveries and inventions. The history of science is that of great mutations which sometimes are highly influenced by the very discoveries of science. These discoveries arise due to the complexity of the reality. The more science perfects its instruments, the more it makes new discoveries on reality, challenging the already established theories and laws. To Popper, scientific discovery is elusive in the framework of instrumentalism for the latter emphasizes only on prediction as the aim of science. Instrumentalism proceeds from events that are already known to predict the unknown phenomena. Such prediction cannot lead to new discoveries. Thus, predictions by way of induction cannot permit science to advance. Progress in science to Popper is only possible if scientific predictions are in form of bold conjectures. The difference between inductive predictions of instrumentalism and conjectural predictions of Popper’s realism is that, while the former is constructed to be confirmed at all cost, the latter is made to be falsified or corroborated. This follows that conjectural predictions can either be true or false.

The first argument Popper mobilises against anti-realism and its derivatives like solipsism, idealism and phenomenology is based on the common sense theory of knowledge. Advocates of absolute certainty will reject Popper’s grounding of realism on commonsense, given that the latter is vague and constitutes an insecure basis of knowledge. Anticipating such criticism, Popper asserts that science can never be grounded on absolutely certain bases. Commonsense to Popper may be insecure but when directed by criticism, it may lead us to develop new theories and learn from our mistakes. For instance, the assumption that the earth is flat was held for long on the basis of commonsense. However, the refutations of this assumption led to more advanced theories of the earth. He thus asserts that “all science, and all philosophy, are enlightened commonsense.”²⁰ Thus, from commonsense as the insecure foundation, we are sure of progress through constant criticism of our errors and continue learning from them. The main thesis in the commonsense argument for realism holds that every individual has the ability to “distinguish between appearance and

¹⁷ Karl Popper, *Conjectures and Refutations, the growth of scientific knowledge*, London, Routledge, 1963, p. 110.

¹⁸ Ibid., p. 113.

¹⁹ Idem.

²⁰ Karl Popper, *Objective Knowledge; An evolutionary approach*, 1974, p. 34.

reality.”²¹ Every ordinary person can equally differentiate between surface reality and depth reality. Reality of higher depths includes kinds like a toothache, a word, a language, a highway code, a novel, a governmental decision, a valid or invalid proof; field of forces, propensities, structures and regularities.²² Popper however insists that realism is fundamentally metaphysical and not scientific. This is because it cannot be tested like theories of empirical sciences. Thus, given the non-applicability of testability on realism popper asserts that realism is “‘metaphysical’ rather than ‘scientific’.”²³ The paradox of rejecting realism to Popper is that any of such arguments is still based on the uncritical aspects of commonsense.

The second argument for realism, to Popper, is based on the nature of scientific theories. Scientific theories, to him, are conjectural on one hand and descriptions on the other hand. Descriptions permit scientists to approximate the truth. Due to Taski’s influence, Popper restituted the correspondence theory of truth, wherein truth is deduced from the correspondence between our descriptions and the real. Thus, we are guaranteed to talk of scientific realism on the basis of the truth-tracking role of conjectural theories. That is, “in the sense that our conjectural theories tend progressively to come nearer to the truth; that is, to true descriptions or certain facts or aspects of reality.”²⁴ When our descriptions correspond to the reality, they are true and when they do not correspond, they are false. The argument from the nature of conjectural theories implies realism. Firstly, it supposes the existence of a mind and language-independent world and secondly it presents the search for the truth as the essential role of scientific theories. In the third place, Popper uses the higher functions of language to justify his realist inclinations. These functions are descriptive and argumentative. Every unambiguous description refers to existing state of affairs and argumentation is possible only if there is an audience. Popper thus asserts that, “rationality, language, description, argument, are all about some reality and they address themselves to an audience. All these presuppose realism.”²⁵

The Symmetry between Non-justificationism and Realism in Popper’s Epistemology

Realism as a philosophical framework of how the scientific activity should be carried out aims at justifying the reliability of science. It is then the foundation of epistemological optimism for its gives reasons why we should trust in science and in the type of knowledge science offers us about our world. Popper defends realism throughout his works but at the same time, he is an advocate of non-justificationism. Thus, our concern here is to examine non-justificationism as characteristic of Popper’s view of the psychology and logic of science. In this section we shall focus on three key points:

The conjectural nature of knowledge

From Conrad Lorenz’s theory of imprinting, and Darwin’s theory of evolution, Popper developed a deductive psychology of knowledge on one hand and the evolutionary theory of knowledge on the other hand. The inductive psychology which he refers to as the bucket theory of knowledge is limited because it implies that the human mind is passive and does not play an active role in the construction and promotion of the growth of knowledge. From Lorenz and Darwin, Popper asserts that the human mind at birth is not a tabular rasa because it has innate mechanisms of expectations, and anticipations. The bucket theory is also weak for it makes claims to certitude. Such certitude is ungrounded given the fallibility of humans. Thus “every animal is born with expectations or anticipations, which could be framed as hypotheses; a kind of hypothetical

²¹ *Ibid.*, p. 37.

²² *Idem.*

²³ *Ibid.*, p. 40.

²⁴ *Idem.*

²⁵ *Ibid.*, p. 41.

knowledge.”²⁶ When these expectations are betrayed by experience, there is the birth of problems, which orchestrate the modification of our previous knowledge. Unlike the justificationist logic of induction where observation precedes problems, the hypothetical nature of the origin of knowledge gives Popper reasons to assert that, “For logical reasons, observations cannot be prior to all problems.”²⁷ Thus observation to Popper is theory-laden. Popper refers to this as the “search light theory”, which to him is a better alternative to the bucket theory. While the bucket theory of inductivists like Locke presents the mind as passive, the search light theory gives an active role into the mind as an instrument for the construction of knowledge that is essentially biological. Every observation is guided by problems, and our sense-organs genetically comprise theories. Popper illustrates this with the example of someone who is asked: “please observe”²⁸, the question one will normally ask is “yes, but what should I observe.”²⁹ Thus, even our senses are instruments that have been disposed to solve biological problems.

Scientific theories are also conjectures or attempted solutions to definite problems. Just like our subjective knowledge is biological, Popper asserts that “science is a biological phenomenon.”³⁰ The development of scientific theory begins with problems which provoke conjectures or attempted solutions. Tentative theories are put under crucial tests. This is the trial and error-elimination method, which is negative because it seeks to refute theories and positive because it permits the growth of knowledge. Science thus proceeds from problems to problems given that even when theories are developed to solve problems, their acceptance is tentative. The conjectural nature of knowledge contradicts the epistemological optimism that goes with scientific realism. If knowledge is conjectural and if theories are accepted from their ability to solve problems and if a theory cannot never solve the problems absolutely then there is a crisis of confidence on scientific knowledge.

The preference of falsification over confirmation

Logical positivism developed verification as the method of confirming or justifying theories. For Moritz Schlick, “The meaning of a proposition is the method of its verification.”³¹ The criterion of the scientific status is meaning and the method of establishing meaning is verification. From logical atomism, logical positivism asserts that language reflects the structure of the world. In Russell, the techniques of verification are acquaintance and definite description. Wittgenstein, on his own part, develops the technique of representation while Moritz Schlick presents verification not as an empirical possibility but as a logical possibility.

However, with the difficulty of justifying natural laws or general statements using particular statements, logical positivists presented them as playing a heuristic role in the verification of particular statements. Firstly, Popper argues that general statements are conjectures, guesses or predictions. With this, he intends to solve the problem of infinite regress that is involved in verifying general statements from particular ones. The conjectural nature of general statements makes the latter to be falsifiable. Thus, verification is not tenable because of, “the approximate character of our knowledge of nature and the impossibility of its definitive

²⁶ Karl Popper, *Objective knowledge*, p. 258.

²⁷ *Ibid.*, p. 259.

²⁸ Karl Popper, *All Life is Problem-solving*, London, Routledge, 1994, p. 6.

²⁹ *Idem.*

³⁰ Karl Popper, *The myth of framework, in defence of science and rationality*, London, Routledge, 1944, p. 5.

³¹ Moritz Schlick, “Meaning and verification” in *Philosophical Review*, vol. 45, N°4, Durham, Duke University Press, 1936, pp. 339-369, p. 341.

verification.”³² Against positivism that defends the possibility of having a definite confirmation or verification of theories, Popper proposes a negative criterion of scientificity, which consists in falsification. This is a non-justificationist criterion of scientificity. While falsifiability refers to the scientific status of a theory, falsification connotes the method of actual testing of already constructed theories. Popper makes the difference between the two notions clearly, as he remarks that:

we must clearly distinguish between falsifiability and falsification. We have introduced falsifiability solely as a criterion for the empirical character of a system of statements. As to falsification, special rules must be introduced which will determine under which conditions a system is to be regarded as falsified.³³

Popper thus, gives a binary linguistic condition for falsification. A theory is falsifiable if it has two sub-classes of basic statements. That is, a class that prohibits and the one that defends the theory. The sub-class that a theory contradicts is referred to as a class of potential falsifiers. If we can identify one observation statement that contradicts a prediction or hypothesis of a theory, the latter is falsified. Unlike the inductive testing that is in tandem with verification, Popper defends the deductive testing of theories using the modus tollens method. To Popper, a deductive inference is valid “if it invariably transmits truth from the premises to the conclusion.”³⁴ A deductive inference can however fail to transmit truth to the conclusion when a counter-example exists. A counter-example is simply another inference which has true premises but a false conclusion. Deduction plays two functions; that is, testing of theories on one hand and selecting a theory among others on the other hand. Scientific theories are general statements which make bold predictions. They predict the non-existence of states of affairs. Thus, if we observe a singular existential statement that contradicts the theory, then the latter is falsified. Popper thus asserts that, “If we accept as true one singular statement which, as it were, infringes the prohibition of asserting the existence of a thing ruled out by the law, then the law is refuted.”³⁵

Popper applied falsification in his classification of the dominance of theories of his time into falsifiable and non-falsifiable categories. The falsifiable theory that attracted his attention was Einstein’s theory of relativity. Einstein’s theory which was developed in 1905 was corroborated in 1919. This is because Einstein’s theory made bold predictions that were falsifiable. This however was not the case with the non-falsifiable theories such as Marx’s theory of history, Freud’s theory of psychoanalysis and Alfred Adler’s individual psychology. These theories claimed to be scientific but Popper rejects their scientificity for lack of bold predictions and the absence of the possibility of crucial experiment and refutations to falsify such predictions. Popper’s preference of falsification over confirmability is the logical base of Popper’s non-justificationism and constitutes an antithesis to the epistemological optimism that characterizes realism.

Even though Popper defends realism, he rejects theories of truths that claim certainty. He refers to the coherence theory, the evidential theory and the pragmatic theory as subjective theories of truth. Francis Bacon and Rene Descartes in the evidential theory assert that even though truth is hidden everyone has the ability to discern it, once it is revealed. Descartes, for instance, develops the four rules that once followed one can attain certainty. With Bacon, if we liberate ourselves from idols or prejudice, we can attain certain truth of nature. Though a realist, Popper rejects the optimism of the evidential theory because of its justificationist

³² Karl Popper, *The two problems of the theory of knowledge*, Trans. Andreas Pickel Troel, Eggers Hensen edition, London-New York, Routledge, 2009, p. 235.

³³ Karl Popper, *unended Quest*, an auto-biography, London, Routledge, 1992, p.165

³⁴ Karl Popper, *unended quest, an autobiography*, London, Routledge, 1992, p. 165.

³⁵ Karl Popper, *The Logic of Scientific Discovery*, p. 48.

tone and its authoritarianism. This thus sets the basis for dogmatism which opposes criticism. For him, “the theory that the truth is manifest not only breeds fanatics possessed by the conviction that all those who do not see the manifest truth must be possessed by the devil.”³⁶ While Descartes uses the authority of God, Bacon uses the authority of the senses. This is the same criticism Popper makes of pragmatism which mistakes truth for usefulness while the coherency theory, for Popper, mistakes consistency for truth. These theories are subjective to him because they consider personal convictions or beliefs as instances of truth.

Given the crisis that mathematics and physics experienced in the 20th century, Taski posed the problem of the difference between the definition of truth and the criterion of truth. Failure to make this distinction was the failure of classical theories of truth. The definition of truth cannot contain the criterion, for the latter should be meta-definitional to determine the former. With the introduction of a meta-language, it is then possible to develop a correspondence theory of truth. In the first moment of his theory of truth, Popper identifies truth with correspondence. That is, “(1) The statement or the assertion, ‘snow is white’ corresponds to the fact if and only if snow is white (2) The statement ‘grass is red’ corresponds to facts if and only if grass is indeed red.”³⁷ This correspondence is only possible if we establish a semantic meta-language on one which describes statements and facts they refer to on one hand and also a syntactical meta-language, which describes only statements, without referring to facts. Thus, it is possible to deduce correspondence between statements and facts using a meta-language.

In the second moment of Popper’s view of truth, he abandons optimism and embrace pessimism. This is because he further argues that it is impossible to establish conclusive correspondence. That is, “the ones (i.e., a set of universal statements) in general cannot be true, but can have different degrees of verisimilitude, which means that they are closer or further from the truth.”³⁸ Verisimilitude then arises from his negativist and non-justificationist methodology of falsification. In this negativist approach, science is not in search for certainty. With the method of falsification, the aim of the scientist to Popper is not just the search for truth but the search for “interesting truth – truth which is hard to come by”³⁹, given our fallibility. What is interesting in the search for such unattainable truth is our ability to learn from our errors and the capacity of such theories to solve problems. That is, “finding that our conjecture was false, we shall have learnt much about the truth and shall have got nearer to the truth.”⁴⁰ Thus, what scientists search for, is approximation of theories to the truth. This is verisimilitude or truth-likeness. By using the logical content, we can evaluate the degree of better or worst correspondence to truth. It can thus be argued that Popper’s concession to realism is betrayed by his rejection of the possibility of certainty in the search for truth. Abandoning the idea of truth and emphasising that learning from our mistakes is prime, amounts to saying that falsity is more important to truth in Popper’s rationality of science.

The predilection of corroboration over probability in testing theories

One of the ways logical positivists approach the problem of induction is through probability. Equating induction to probability Rudolf Carnap affirms that, “if it were possible to find a satisfactory definition of logical probability, this could at last supply a clear rational basis for the controversial procedure of inductive

³⁶ Karl Popper, “On the sources of knowledge and ignorance”, in *international studies in Philosophy of science*, vol. 20, N^o 2, London, Oxford University Press, 1966, pp. 185-213, p. 187.

³⁷ Karl Popper, *conjectures and Refutations*, p. 224.

³⁸ *Idem*.

³⁹ *Ibid.*, p. 228.

⁴⁰ *Ibid.*, p. 231.

inference. I therefore call theory of probability, inductive logic.”⁴¹ Thus, probability, to Carnap, is simply the degree of confirmation of a theory. Probability involves conformability and thus justificationism. This is why Karl Popper develops corroboration as a better alternative to probability in the context of testing theories. While logical positivism develops probability as a measure of the confirmative instances of a theory, Popper shuns such justificationism by introducing corroboration which evaluates how a theory “stands up to these tests.”⁴²

Corroboration evaluates how fit a theory is in the context of testing. While probability seeks to justify, corroboration seeks to falsify. In this case, Popper asserts, “I originally introduced the idea of corroboration, or degree of corroboration’, with the aim of showing clearly that every probabilistic theory of preference [...] is absurd.”⁴³ Corroboration is thus, “an evaluating report of past performance.”⁴⁴ The notions of compatibility and incompatibility are capital in the way the degree of corroboration of a theory is carried out. While incompatibility implies the falsification of a theory, compatibility implies the tentative acceptance of a theory. However, compatibility does not imply justificationism for, “the mere fact that a theory has not yet been falsified can obviously not be regarded as sufficient.”⁴⁵ Positive degree of corroboration is established, when the theory is “compatible with the statement.”⁴⁶ Nevertheless, if the theory is incompatible with accepted basic statements, then it has negative degree of corroboration and is thus falsified. One of the reasons Popper thinks that we should not count on the positive degree of corroboration is that even Palmists and soothsayers can cautiously make their predictions with an extremely high degree of probability. Corroboration is thus closer to improbability than probability, because while corroboration is based on the informative content of a theory, probability does not emphasise on the informative content of theories. At this level, Popper distances himself from optimistic and positive methods of testing theories. He insists that, “the fundamental difference between my approach and the approach for which I long introduced the label ‘inductivist’ is that I lay stress on negative arguments, such as negative instances on counter-examples, refutations, and attempted refutations – in short, criticism – while the inductivist lays stress on positive instances.”⁴⁷

Popper qualifies his method of testing theories as negativist, non-justificationist and pessimistic. It is in contradiction with epistemological optimism that scientific realism is defended by Popper. This leads to a dual challenge either reinterpreting Popper’s realism or evaluating the impact of tension between realism and non-justification in the development and practice of science.

Beyond the Tension between Realism and Non-justificationism

In this section of our paper, we shall examine the views of those who have offered solutions to the dichotomy between realism and Non-Justificationism. After that we shall offer our own solution.

Lakatos’ positive reinterpretation of falsification

Falsification is the grounding of Popper’s non-justificationism for it is the former logic of scientific rationality. Imre Lakatos argues that the intention of scientists in testing theories is not always negative. To

⁴¹ Rudolf Carnap, *Intellectual Auto-biography in the philosophy of Carnap*, Paul Aurther edition, Peru, Public Court Publishing Company, 1963, p. 71.

⁴² Karl Popper, *The logic of scientific Discovery*, p. 82.

⁴³ Karl Popper, *Objective knowledge*, p. 18.

⁴⁴ *Idem*.

⁴⁵ Karl Popper, *op.cit.*, p. 264.

⁴⁶ *Ibid.*, p. 264.

⁴⁷ Karl Popper, *op.cit.*, p. 21.

him, “scientists have thick skins. They do not abandon their theories.”⁴⁸ A single counter-observation to Popper warrants the falsification of a theory, however, Lakatos just like in the Duhem-Quine Thesis, holds that in most cases, scientists construct ad hoc hypotheses so as to reinterpret a theory which produces contradictions. Lakatos attempts to correct the negative connotation of falsification by viewing scientific theories as research programmes and not independent and isolated hypotheses. The history of science is thus an extension of research programmes and none of the theories should be evaluated in isolation. Each of these research programmes has a hard core that should be protected from falsification. The hard core refers to the principles of each theory like the basic laws of Newtonian mechanics. Lakatos thus affirms that: “Newton’s theory of gravitation, Einstein’s relativity theory, quantum mechanics, Marxism, Freudism, are all research programmes, each with a characteristic hard core stubbornly defended each with its elaborate problem-solving machinery.”⁴⁹ This hardcore refers to a ‘vast belt’ of auxiliary hypotheses. That is why Lakatos asserts that Einstein’s theory merely subsumed Newton’s by introducing bold predictions. Progressive research programmes are theories that make new predications while degenerating research programmes are those that lag behind facts.

Lakatos revision of Popper looks very original but a critical look does not give him much credence. This is because Lakatos ignores the idea of problem-solving and the necessity to ensure the growth of knowledge. It is because of these two motivations that Popper developed his logic of falsification. When Lakatos ignores the role of counter-example, his sophisticated falsification seems weak when confronted with how medical science functions. Popper argues that refutation does not imply the abandonment of the theory. Even when theories are refuted, scientists continue to work on them by making generalisations. He illustrates this by observing that, “Einstein regarded relativity as false, yet a better approximation to the truth than Newton’s gravitational theory. He certainly did not abandon it. But he worked to the end of his attempt to improve upon it by way of a further generalisation.”⁵⁰

Reinterpretation of realism in the context of the crisis of truth

In Evandro Agazzi, addition of *Varieties of Scientific Realism*, he raised the problem of restoring confidence in science in the context of the impossibility of establishing certainty in science. He thus poses the question, “how can we recover confidence in the cognitive capacity of science without falling back into the difficulties that surface when we attribute to science the capacity of attaining truth.”⁵¹ Evandro Agazzi argues that we can overcome the dilemma above, by replacing the notion of truth with the notion of objectivity. Science in this case becomes the search of objectivity and not the search of truth. Objectivity to Evandro Agazzi is inter-subjective criticism. Popper defends the same view of objectivity. Arguably, Agazzi’s projection of objectivity as the aim of science does not differ from Popper’s tentative theory of the truth. If objectivity is in inter-personal criticism, then one can never be absolutely certain of his ideas and theories. Every idea or theory is subject to criticism and one cannot continue to hold on to an idea or theory that has been rejected through sound criticism.

In the same approach, Mario Alai proposes selective realism as a better option for a non-justificationist rationality of science. In the situation where truth cannot be established with certainty, Alai asserts that focus

⁴⁸ Imre Lakatos, *Methodology of Scientific Research Programmes*, Ed. John Worrall and Gregory Currie, Cambridge, Cambridge University Press, 1975, p. 4.

⁴⁹ *Ibid.*, p. 5.

⁵⁰ Author Schlipp, *The Philosophy of Karl Popper*, Illinois, Open Court Publishing Co., 1977, p. 1009.

⁵¹ Evandro Agazzi, *Varieties of Scientific Realism, Objectivity and Truth in Science*, Cham, Springer, 2017, p. 55.

should be on aspects of theories which approximate the truth. He affirms that, “selective realists are committed only to the truth of some parts of certain theories, and stress the continuity between past, present and future science.”⁵² He thus implies that verisimilitude and research programmes are forms of selective realism. This view is however akin to Lakatos’ sophisticated falsification but the idea of continuity does not fit in to the evolutionary spirit of Popper’s rationality of science.

Popper’s Critical Realism as the Basis of ‘Critical Optimism’

Our contention here is that, the logical way of bridging the gap between realism and non-justificationism in Popper, is to situate these two within the context of the general problem of Karl Popper’s epistemology. Philosophical theses are always developed to solve cognitive and existential enigmas. Thus, it is logically unpleasant to evaluate the consistency of the theses of an author without first of all identifying the philosophical problem, which he sets to resolve. This is seemingly what has been ignored by philosophers who have invested into examining the consistency of Popper’s philosophy of science.

In the preface to the first English edition of *The Logic of Scientific Discovery*, Popper asserts that, “The central problem of epistemology has always been and still is the problem of the growth of knowledge. And the growth of knowledge can be studied best by studying the growth of scientific knowledge.”⁵³ Thus, to Popper, the central problem in philosophy of science is that of the growth of knowledge and the paradigm of the growth the latter is scientific progress. He sees commitment to ensure the growth of knowledge as the moral responsibility of every researcher in science. He thus asserts that, “the first duty of every serious student is to further the growth of knowledge by participating in the search for the truth – or in the search for better approximations to the truth course”⁵⁴ and this ceaseless search for the truth is due to the fallibility of all humans. The study of the growth of knowledge and conditions possible for this growth to Popper is important because it guarantees the rationality of science. That is, “continued growth is essential to the rational and empirical character of scientific knowledge; that is, if science ceases to grow, it must lose its character.”⁵⁵ Thus, the empirical and rational characters of science are grounded on scientific progress. Justificationism makes science cumulative and thus resistant to change and progress. Popper thus distances himself from excessive optimism that some realists may expect from him and also justificationists who seek secured formations to science. He thus remarks that, “security and justification of claims to knowledge are not my problem. Instead, my problem is the growth of knowledge.”⁵⁶ It is only through the negative method that we can ensure the growth of knowledge. Thus, an appreciation of the conjunction of realism and non-justificationism should necessarily by circumscribing Popper’s philosophy of science within the context of scientific progress amounts to two implications; Firstly that his realism is metaphysically “firm” for it asserts the existence of the mind-independent world. This is illustrated by the common sense argument for realism, the propensity interpretation of quantum physics and the theory of three worlds. The metaphysical thesis, permits him to develop an objective theory of knowledge. The metaphysical thesis of the mind-independent world is “firm” as it does not overly clash with his non-justificationist stance. The crisis of optimism evoked in this paper concerns mainly the epistemological thesis of realism which is supposed to advocate for epistemological optimism. Secondly, Popper’s view of the epistemological thesis is “cautious” for even if we cannot not attain

⁵² Ibid., p. 30.

⁵³ Karl Popper, *The Logic of Scientific Discovery*, p. xix.

⁵⁴ Karl Popper, *The myth of framework*, p. 123.

⁵⁵ Karl Popper, *Conjectures and Refutations*, p. 215.

⁵⁶ Karl Popper, *Objective Knowledge*, p. 37.

certain truths in science we can positively learn from our errors at the same time enhancing progress in science.

Optimism in Popper's rationality of science is translated by our ability to learn at the subjective level the constant progress of science at the theoretical levels and the resolution of problems at the pragmatic level. Even when fundamental realists advocate for a theory of certain truth, that quest is not an end in itself. There is no other role of the truth other than extending our knowledge of the mind independent world. Science studies this reality in the context of specific problems. It is not then how evident and resistant to criticism that a theory is, that makes science reliable but how those theories further our knowledge by making us understand the world and see scientific problems from ever new perspectives. Popper defends this, when he affirms:

The history of science, like the history of all human ideas, is a history of irresponsible dreams, of obstinacy and of error. But science is one of the very few human activities – perhaps the only one – in which errors are systematically criticised and fairly often corrected.⁵⁷

Scientific progress then is non-cumulative through crucial experiments and replacement of falsified theories with those that have resisted refutation. There is progress then when a theory solves problems. In the history of science, Popper identifies the application of his principle of progress. This is because when Newton's theory subsumed and superseded those of Kepler and Galileo, Frenel's and Faraday's theories were subsumed and superseded by Maxwell's. However, Einstein's theory united and superseded those of Newton and Maxwell.⁵⁸ A theory supersedes others when it is logically and better testable than them. The fact that we can progress in science in terms of our description of the world and our understanding and resolution of problems, implies that we can rely on science.

The merits of the evolutionary character of knowledge in Popper are linked to reliabilism as espoused by Peter Lepton in Anthony O'Hear's edition of *Karl Popper – Philosophy and Problems*. To Lepton, reliabilism is the view that, "a true belief is knowledge just in case one has good reasons [...] belief was generated by a reliable method or process."⁵⁹ Thus, making a reliabilist interpretation of Popper implies an evaluation of the tenability and reliability of the non-justificationist method. The reliability is plausible for we learn from such a method, it assures the progress of science and make science an instrument of resolving human problems. Besides the reliability of Popper's method, Lepton equally states the positive aspect of negative knowledge that Popper defends. He asserts that, "from a reliabilist point of view, [...] falsification becomes reliable rejection. If using the deductive relation enables scientists to reject falsehoods and not reject truth, then they can know that the theories they reject are false."⁶⁰ Truth in Popper, thus plays but a regulatory role. It enhances our constant rejection of falsehood, which is a positive aspect. It can thus be asserted that what falsification rejects is not the truth but falsehood, given that a theory that passes a crucial experiment is held to be tentatively true. Truth in the objective sense then is an ideal. To Popper, "the very idea of error and fallibility involves the idea of an objective truth as the standard of which we may fall short. It is in this sense that the idea of truth is regulatory."⁶¹ By conjecturing and refuting theories, we can only approximate the truth. It can thus be summed from the above that though Popper is firm in his metaphysical thesis of realism but cautious in his epistemological thesis for the enhancement of the growth of knowledge to him should be

⁵⁷ Karl Popper, David Miller – *A pocket Popper, Popper's selection*, Glasgow, Fontana Press, 1983, p. 172.

⁵⁸ *Ibid.*, p. 176.

⁵⁹ Peter Lepton, Anthony O'Hear, *Karl Popper: Philosophy and problems*, Cambridge, Cambridge University Press, 1995, p. 35.

⁶⁰ *Ibid.*, p. 40.

⁶¹ David Miller, *op.cit.*, p. 190.

the interest of any one that is committed to science. He sums this in the following remarks, “I think myself, then, as a metaphysical realist who accepts the theory of evolution and who, I should perhaps add, introduced the dynamic problem of the growth of our knowledge into the philosophy of science.”⁶²

Such a metaphysically firm and an epistemologically cautious realism is critical. What is lacking in most of the philosophers that have attempted to restore consistency in Popper’s thought is the failure to take Popper’s notion of ‘critical realism’ seriously. In Paul Arthur Schilpp’s edition of *The Philosophy Of Karl Popper* by Open Court Publishing in 1974, in two volumes, there are 33 critical essays on Popper and some are addressing the problem of the consistency of his thought. Part three of the second volume of this text is dedicated to Popper’s response to his critics. In his response to W. N. Watkins’s paper on “The unity of Popper’s thought”, Karl Popper implicitly address the problem of the opposition between realism and non-justificationism in his philosophy. He refers to his realism in the first place as common sense critical realism which he which is based on the thesis that “man is one of the animals, and human knowledge as essentially almost as fallible as animal knowledge”⁶³ that is, in critical realism man is an active explorer of the world. He is fallible and thus will constantly err but the positive aspect is that he does not only learn when he errs but he learns why he errs. The hope of learning from our errors and knowing why we err is what Popper calls ‘critical optimism’. He thus remarks that “I should be inclined to regard my emphasis on *criticism* (or the doctrines of critical realism or critical optimism) as being more appropriate.”⁶⁴ Over-optimism gives rise to justificatonist theories like the truth-manifest theories of Descartes and Bacon. Such theories are forms of fanaticism for they oppose criticism and thus cannot ensure the growth of knowledge. Optimism which cannot permit the growth of knowledge can thus be qualified as ‘dogmatic optimism’ as opposed to “critical optimism which realizes that it is human to err.”⁶⁵ Thus, in critical realism, “We learn not only *that* a theory is wrong; we learn *why* it is wrong. Above all else, we gain a *new and more sharply focused problem*; and a new problem, as we already know, is the real starting point for a new development in science.”⁶⁶ Thus, when situated in the context of the growth of knowledge, that is, evolutionary epistemology, realism and non-justificationism conflate in Popper’s rationality of science.

Conclusion

Our reflection in this paper was motivated by the debate on the consistency of Karl Popper’s Philosophy of science. As a great theoretician of the psychology, logic and philosophy of science, Karl Popper’s epistemology is one of the paradigmatic epistemological edifices today. As a realist, Karl Popper defends the ability of scientific theories tracking the truth from the world. He defends the thesis of a mind-independent and an objective world. This is plausible in his common sense realism, his theory of the three worlds and in the propensity interpretation of quantum physics. Though a realist, Karl Popper develops an evolutionary epistemology grounded on the non-justificationist methodology. Popper’s psychology of knowledge is non-justificationist because he defends the conjectural character of knowledge, his logic of science is negative because falsification, and not confirmation, is the criterion of scientificity and he also defends the theory of tentative truth. Thus, Popper opens the doors for pessimism and skepticism into his rationality of science. While some philosophers think that such negative methodology is antithetical to realism and merit the instrumentalist connotation, others reinterpret and revise Poppers’s falsification and realism to establish the

⁶² Karl Popper, *All life is problem solving*, p. 24.

⁶³ Paul Arthur Schilpp, *The Philosophy Of Karl Popper*, p. 1059.

⁶⁴ *Ibid.*, p. 1053.

⁶⁵ Karl Popper, *The Myth of Framework*, p., 204.

⁶⁶ Karl Popper, *All Life is Problem-Solving*, p. 13.

consistency of his thought. In our paper, we have presented the basic tenets of Popper's realism, at the same time illustrating the different moments of opposition between his realism and his non-justificationism. Unlike some philosophers who reinterpret Popper's logic and his realism to make his system consistent, we have gone beyond alternative solutions to situate the two seemingly contradictory these of his philosophy in the context of the general problem of knowledge; that is, evolutionary problem of the growth of knowledge. Such approach sets the basis for Popper's critical realism which aims at the rejection of 'dogmatic optimism' and the promotion of 'critical optimism'

BIBLIOGRAPHY

1. **Agazzi, Evandro** *Varities of Scientific Realism, Objectivity and Truth in Science*, Cham, Springer, 2017.
2. **Carnap, Rudolf**, *Intellectual Auto-biography in the philosophy of Carnap*, Paul Aurther edition, Peru, Public Court Publishing Company, 1963.
3. **Godfrey-Smith, Peter**, *An Introduction to the Philosophy of Science, Theory and Reality*, Chicago-London, University of Chicago Press, 2003.
4. **Lakatos, Imre**, *Methodology of Scientific Research Programmes*, Ed. John Worrall and Gregory Currie, Cambridge, Cambridge University Press, 1975.
5. **Howard Sankey & Dimitri Ginev**, "The Scope and Multidimensionality of the scientific Realism", in *Gen Philo Sci*, N°42, 2011, pp. 263-283, Springer.
6. **Lepton, Peter, Anthony O'Hear**, *Karl Popper: Philosophy and problems*, Cambridge, Cambridge University Press, 1995.
7. **Losee, John**, *A Historical Introduction To Philosophy of Science*, 4th ed., New York, Oxford University Press, 2001.
8. **O'Hear, Anthony**, *Karl Popper: The Arguments of the Philosophers*, London, Routledge, 1982.
9. **Popper, Karl**, *Unended Quest, An Intellectual Autobiography*, London-New York, Routledge, 1974.
10. **Popper, Karl**, *Realism and the Aim of Science*, From Postscript to the Logic of Scientific Discovery, London-New York, Routledge, 1983.
11. **Popper, Karl**, *Objective Knowledge; An Evolutionary Approach*, revised edition, Oxford, Clarendon Press, 1974.
12. **Popper, Karl**, *Conjectures and Refutations, the growth of scientific knowledge*, London, Routledge, 1963.
13. **Popper, Karl**, *Objective Knowledge; An evolutionary approach*, 1974.
14. **Popper, Karl**, *All Life is Problem-solving*, London, Routledge, 1994.
15. **Popper, Karl**, *The myth of framework, in defence of science and rationality*, London, Routledge, 1944, p. 5.
16. **Popper, Karl**, *The two problems of the theory of knowledge*, Trans. Andreas Pickel Troel, Eggers Hensen edition, London-New York, Routledge, 2009.
17. **Popper Karl**, *unended quest, an autobiography*, London, Routledge, 1992.
18. **Popper, Karl, David Miller** – *A pocket Popper, Popper's selection*, Glasgow, Fontana Press, 1983.

19. **Popper Karl**, “On the sources of knowledge and ignorance”, in *international studies in Philosophy of science*, vol. 20, N^o 2, London, Oxford University Press, 1966.
20. **Psillos, Stathis**, *Scientific realism, How Science Tracks the truth*, London-New York, Routledge, 1999.
21. **Saatsi Juha**, (Ed.), *Routledge Handbook of Scientific Realism*, London-New York, Routledge, 2018.
22. **Schlick, Mortz**, “Meaning and verification” in *Philosophical Review*, vol. 45, N^o4, Durham, Duke University Press, 1936.
23. **Schlipp, Authur**, *The Philosophy of Karl Popper*, Illinois, Open Court Publishing Co., 1977.